

**I. AMENDMENTS TO THE CLAIMS:**

Kindly amend claim 1 and add new claims 16-21 as follows.

The following Listing of Claims replaces all prior listings, or versions, of claims in the above-captioned application.

**Listing of Claims:**

1. (Currently Amended) A free curved surface precision machining tool for precision-machining a surface to be machined with a lower end in contact therewith by rotation around a vertical axis  $z$  of a tool body of the precision machining tool, the precision machining tool comprising:

a drum-shaped tool having an orthogonal axis  $x$  orthogonal to the vertical axis  $z$  of the tool body and rotationally driven around the orthogonal axis  $x$ , wherein the drum-shaped tool has a convex machining surface in the form of an arcuate rotary body obtained by rotating an arc of radius  $r$  with the center of the arc at the intersection  $O$  between the vertical axis  $z$  and the orthogonal axis  $x$  around the orthogonal axis  $x$ ;

a driven gear disposed on both sides or one side of the drum-shaped tool; and

a main driving gear disposed to drive the driven gear, wherein the driven gear and the main driving gear are disposed within the tool body and the main driving gear is rotationally driven by a belt provided within the tool body,

whereby the convex machining surface contacts the surface to be machined to precision-machine the surface to be machined, while the convex machining surface is rotated around the orthogonal axis  $x$  so as to disperse a machining position of the convex machining surface, and wherein the tool body has a length and a radius and is cylindrical in shape.

2. (Withdrawn) The free curved surface precision machining tool according to claim 1, wherein the radius  $r$  is set to be smaller than a maximum radius  $R$  of the convex machining

surface from the orthogonal axis  $x$ , whereby position control of a machining trajectory is performed at the center  $O$  of rotation of the arc.

3. (Withdrawn) The free curved surface precision machining tool according to claim 1, wherein the radius  $r$  is set to be larger than a maximum radius  $R$  of the convex machining surface from the orthogonal axis  $x$ , whereby position control of a machining trajectory is performed at a center  $A$  of a lowest arc.

4. (Previously Presented) The free curved surface precision machining tool according to claim 1, wherein the convex machining surface of the drum-shaped tool is provided by a grindstone or a cutter.

5. (Previously Presented) The free curved surface precision machining tool according to claim 4, wherein the convex machining surface is provided by the grindstone that includes a metal in a bonding material of the grindstone.

6. (Withdrawn) The free curved surface precision machining tool according to claim 1, further comprising a non-machining section for protecting the lower end of the convex machining surface without direct involvement in machining, wherein the non-machining section is adjacent to the convex machining surface of the drum-shaped tool.

7. (Withdrawn) The free curved surface precision machining tool according to claim 6, wherein the non-machining section is made of a first material that wears out more easily than a grindstone bonding material so as not to damage the surface to be machined, and the first material of the non-machining section includes a conductive material.

8. (Withdrawn) The free curved surface precision machining tool according to claim 1, further comprising an impeller disposed on both sides or on one side of the drum-shaped

tool and a flow channel disposed to emit a jet of fluid to the impeller in the rotative direction, wherein the drum-shaped tool is rotationally driven around the orthogonal axis x.

9. (Withdrawn) The free curved surface precision machining tool according to claim 1, further comprising a belt in contact with an outer peripheral surface of the drum-shaped tool and a pulley for holding the belt between the pulley and the drum-shaped tool, wherein the drum-shaped tool is rotationally driven around the orthogonal axis x by rotation of the belt.

10. (Withdrawn) The free curved surface precision machining tool according to claim 9, wherein the belt has a polishing surface on a side in contact with the outer peripheral surface of the drum-shaped tool so as to correct the convex machining surface of the drum-shaped tool as soon as the drum-shaped tool begins to be rotationally driven.

11. (Withdrawn) The free curved surface precision machining tool according to claim 6, further comprising a pulley in contact with an outer peripheral surface of the non-machining section and a belt for rotationally driving the pulley, wherein the drum-shaped tool is rotationally driven around the orthogonal axis x by rotation of the pulley.

12. (Previously Presented) The free curved surface precision machining tool according to claim 1, wherein the main driving gear is driven by the belt so as to rotationally drive the drum-shaped tool around the orthogonal axis x.

13. (Original) The free curved surface precision machining tool according to claim 1, further comprising correction means for correcting the convex machining surface of the drum-shaped tool.

14. (Withdrawn) The free curved surface precision machining tool according to claim 13, wherein the correction means is formed of grindstone, electrolysis, or discharge means or combined means thereof.

15. (Previously Presented) The free curved surface precision machining tool according to claim 13, wherein the correction means functions simultaneously with machining of material to be machined.

16. (NEW) The free curved surface precision machining tool according to claim 1, wherein the length of the cylindrical tool body is substantially greater than the radius of the cylindrical tool body.

17. (NEW) The free curved surface precision machining tool according to claim 1, wherein the cylindrical tool body has a cavity formed therein and opening on one end of the cylindrical tool body so as to form a tubular portion, and the drum-shaped tool is disposed in the cavity so as to rotate about the orthogonal axis x.

18. (NEW) The free curved surface precision machining tool according to claim 17, wherein the drum-shaped tool has a first groove formed therein on a first side.

19. (NEW) The free curved surface precision machining tool according to claim 18, wherein the drum-shaped tool has a second groove formed therein on a second side.

20. (NEW) The free curved surface precision machining tool according to claim 19, wherein the drum-shaped tool has a hole formed therein that extends along the orthogonal

axis x, and a shaft and bearing are disposed in the hole so that the drum-shaped tool rotates about the orthogonal axis x and substantially within the cavity of the cylindrical tool body.

21. (NEW) The free curved surface precision machining tool according to claim 13, wherein the cylindrical tool body has a cavity formed therein at one end, and the drum-shaped tool is disposed in the cavity so as to rotate about the orthogonal axis x, and at least a portion of the correction means is disposed on a surface of the tool body defining the cavity so that the correction means corrects the convex machining surface of the drum-shaped tool.